

person moves through the closure, the upper segments of the closure part. After the person has moved through the closure, panels 11 and 12 close on each other, regardless of whether panel 11 is in front of panel 12 or vice versa. This is because the magnetic force between magnets 21 and 22 is directed in a plane substantially parallel to panels 11 and 12 and because there is no overlap between the panels, with the panels coming into abutting relationship along outer hemlines 27 and 28.

Magnets 21 and 22 can be inserted into hems 23 and 24 by bonding the rear faces thereof, having relatively weak magnetic poles, to inner hemlines 29 and 30. In the alternative, the permanent magnets can be formed by providing spaced regions of ferrous oxide powder in a plastic binder in hems 23 and 24. The plastic binder is heated to substantially simultaneously coalesce the ferrous oxide powder and bond the powder to hemlines 27-30. Thereafter, opposite polarity magnetic fields are applied to opposite ends of faces 25 and 26 of the fused ferrous oxide powder to form the permanent magnets. The technique of utilizing ferrous oxide powder in a plastic binder with a subsequent fusing action avoids possible problems of magnetic deterioration due to the Curie effect.

While permanent magnets are illustrated as being included in hems 23 and 24, it is to be understood that only one of the hems need include such a permanent magnet and that the other hem may include spaced elements of high magnetic permeability, such as iron slugs. The iron slugs would be positioned in identically the same manner as the correspondingly located permanent magnets. It is also to be understood that the principles of the invention apply if only one of panels 11 and 12 is flexible, and that the other panel can be relatively rigid. In such an instance, the permanent magnets or elements of high magnetic permeability are positioned on the rigid panel in the same manner as the permanent magnets or elements of high magnetic permeability are located on the flexible panel or an elongated ferrous strip can be provided in the rigid panel. In either case, the magnetic force from the permanent magnet is provided across the boundary in a direction generally parallel to the plane of the rigid panel and the flexible panel when the closure device is closed.

If only one of panels 11 or 12 is flexible, in accordance with a further alternative, the magnetic force in the plane parallel to the fixed and flexible panels can be provided by an elongated permanent magnet strip including magnetized pole faces on opposite faces of the strip. Such a configuration is illustrated in FIGS. 1, 2 and 4 for the horizontally extending portion of the closure device between lower edges 15 and 16 of panels 11 and 12 and threshold 17.

The closure device between threshold 17 and each of edges 15 and 16 is formed by providing an elongated magnetized strip 32 that is mounted in a recess on the upper surface of non-magnetic longitudinally extending, relatively rigid threshold member 33. Strip 32 is magnetized so that the north and south pole faces of the magnet are on opposite faces 34 and 35 of the strip. Thereby, while the closure device is closed, the pole faces provide a magnetic force component that extends, to a certain extent, in planes including and parallel to the plane of panels 11 and 12. The magnetic force from magnet 32 provides an attractive force for corresponding gapped magnetic elements extending hori-

zontally along the bottom edges 15 and 16 of flexible panels 11 and 12. The gapped magnetic elements along edges 15 and 16, in the embodiment of FIGS. 1, 2 and 4, comprises link chains 36 and 37, which are fabricated of material having high magnetic permeability such as iron. Link chains 36 and 37 inherently provide the flexibility for edges 15 and 16 that is provided by including spaced members of high magnetic permeability in one of hems 23 or 24. Of course chains 36 and 37 inherently provide the necessary air gaps for the magnetic field derived from strip 32 and therefore such a chain can be substituted for the magnets along one of the vertically extending borders.

In operation, after outer seams 27 and 28 have closed so they are in contact throughout their lengths, link chains 36 and 37 contact and are held in situ against the magnetized upper surface 34 of strip 32 to provide complete closure of panels 11 and 12 against threshold 17. Because of the air gap between adjacent links of chains 36 and 37, edges 15 and 16 do not bunch from center line 18 to the points where the edges are pinned to the extremities of threshold 17.

It is noted that outer hemlines 27 and 28 are in abutting relationship throughout their lengths so that there are no air holes in the slit formed between the two outer hemlines. Similarly, no air holes subsist in the slit between the lower edges 15 and 16 and threshold 17. Thereby, the closure device of the present invention is particularly adapted for use with structures in which it is important to prevent relatively small objects, such as insects or flies, from moving through the closure device while it is closed.

In this connection, reference is made to FIG. 5 wherein the closure device illustrated in FIGS. 1-4 is illustrated as the door of a tent 41. The door is comprised of flexible panels 11 and 12 having abutting vertical edges 13 and 14 and horizontally extending lower edges 15 and 16 that are in abutting relationship with the permanent magnet strip 32 that extends along threshold 17. Flexible panels 11 and 12 are sewn at their outer and top edges to a rectangular cutout in tent 41. Thereby, the upper corners of edges 13 and 14 have an apex, along center line 18 at the intersection of the center line with the upper portion of the cutout region of the tent.

The invention can also be employed as a closure device in many other applications. For example, the invention is illustrated in FIG. 6 as a closure device for a garment having a longitudinally extending opening in the vertical direction as defined by the edges of panels 42 and 43. The garment preferably includes a mechanical fastener 44 which initially joins the upper edges of panels 42 and 43 together. After fastener 44 has joined the upper edges of panels 42 and 43 together, the remaining portions of the panels are automatically joined together by the combined forces of gravity and the magnetic forces that subsist across the boundary of the closure, as provided by permanent magnets 21 and 22.

While there have been described and illustrated several specific embodiments of the invention, it will be clear that variations in the details of the embodiments specifically illustrated and described may be made without departing from the true spirit and scope of the invention as defined in the appended claims.

I claim: